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Evaluating user readiness towards digital society: a Rasch measurement model analysis

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Abstract

The emergence of the internet has brought about many implications to the already existing media and the way we communicate to one another and do things. Several scholars have conducted studies to understand the factors responsible for technology acceptance. The Technology Acceptance Model (TAM) is one of the much referred models for technology acceptance where perceived ease of use and perceived usefulness are recognized as the two main factors that influence computer usage behavior. Subsequently, there have been several studies aiming at extending and modifying the TAM by proposing additional variables believed to contribute to the acceptance of technological innovation. This study aims at exploring and testing other factors that have not been explained by Technology Acceptance Model (TAM) in determining the acceptance of communication and information technology (ICT). A survey was conducted to obtain the necessary primary data from 300 respondents in the Klang Valley, a metropolis consisting of the federal territory of Kuala Lumpur and the state of Selangor. Rasch measurement model is used in analyzing the data in measuring the readiness of the respondents towards being a digital society. Ten constructs are prescribed in the questionnaire to better understand the society and the Internet and its application usage.

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Keywords: Internet usage; Technology Acceptance Model; digital society; Rasch measurement model.

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1. Introduction

The advent of the internet has brought about many implications to the already existing media and the way we relate to one another and do things. The Internet is seen as the most dynamic mass media in this century and its interactive nature has attracted people from all walks of life. Unlike its predecessors like the TV and radio, the Internet is also a storehouse of knowledge providing access to huge pile of information. The society can derive a lot of benefits from the Internet ranging from communication to education, entertainment, business and what have you [1, 2, 3]. Hence, the Internet provides benefits which impact the life of the users or community [3].

The growth in internet acceptance and usage throughout 2012 has not shown signs of slowing down, either on a global or local level. Facebook users still dominate with 13,544,600 and grew by more than 1,387,460 in the first 6 months of 2012 [4].

Several scholars have conducted studies to understand the factors responsible for technology acceptance. The Technology Acceptance Model (TAM) is one of the much referred models for technology acceptance. There are several studies aiming at extending and modifying TAM by proposing additional variables believe to contribute to acceptance of technological innovation. The technological innovation, in this study, is taken to mean the Internet.

This study aims at testing other factors that have not been explained by Technology Acceptance Model (TAM) in determining the acceptance of communication and information technology (ICT). This study therefore explores other variables which may also influence user acceptance towards internet. Hence, the objective of the present study is to investigate the influence of factors which may be unique to Malaysian situation, on the acceptance and usage of information and communication technology.

2. Technology Acceptance Model (TAM)

The acceptance and use of social media can be predicted by Technology Acceptance Model (TAM) proposed by Davis in 1989. TAM was rooted in the Theory of Reasoned Action (TRA) [5]. Although many theories have been proposed to explain and predict of a system, the Technology Acceptance Model (TAM) has been the only one which has captured the most attention in the information systems fields [6]. TAM is generally considered as the most influential and plays a signified issue in the area of information systems since this theory was introduced by Davis in 1989 [7, 8, 9, 10].

TAM introduced perceived ease of use and perceived usefulness as the two main factors that influence computer usage behavior. These two determinants serve as the basis for attitude towards using a particular system, which in turn determines the intention to use and then generates the actual usage behavior [11]. According to TAM, perceived ease of use refers to the extent to which a person feels that using a particular technology would be free of effort. With regard to social media, PEOU is defined as the degree to which a student believes that using social media would be free of effort. On the other hand, perceived usefulness refers to the degree to which a student believes that using social media will be useful for him/her.

TAM has been applied in many studies and found that perceived ease of use and perceived usefulness were significantly related to computer usage [12, 13]. TAM has been utilized to different technologies for instances word processors, e-mail, WWW, hospital information systems under different situations such as time and culture with different control factors like gender, organizational type and size and different subjects like undergraduate students, MBAs, and knowledge workers which leading its proponents to believe in its robustness [7]. TAM already becomes an interdisciplinary theory. Currently, the mainly concerned area of TAM are computer science, information systems, management, information science & library science, business and also cybernetics [10].

3. Research methodology

Common practice in gathering users' perception is by using questionnaire that has Likert-type items for user to choose their preference. Data from these type of observations are of ordinal, where user give their preference according to their likings. For example, user would choose either to Strongly Agree/Agree/Disagree/Strongly Disagree which are represented by ordered numbers of 5, 4, 3, 2, 1 representing each respective preference. Collected ordinal type of data can report only on measurement of central tendency [14] which scores that occurs

most frequencies and numerical centre of the data. It is not possible to report on much more or less the agreement or disagreement is. The numbers only indicate a rank ordering of preference, but did not indicate the exact distances between the units [15]. Analysis on non-parametric statistical would only give indication on variance analysis [16] and not of measurement property [17]. Variance analysis would only indicate whether there is significant correlation between the variables. Further evaluations or description on the items and person are not revealed.

Even though there are conflicts between researchers indicating that ordinal type of data can be treated as interval type data [18, 19, 20] where calculation properties can be done on the data. Nonetheless, a rating scale such as the Likert scale for CTT analysis is often mistaken as an interval data and misused in parametric statistical procedures [21]. Rasch measurement model (Rasch) provides the means for constructing interval measures from these kind of raw data. Rasch will treat the ordinal preference into probability of an event and transformed the data into ratio data [17]. Rasch also enable small fit-for-purpose type of sampling to be analysed [22].

A computer program Winsteps is used in generating raw scores into skill items and task difficulty calibrations and person ability estimates which is expressed in linearized log odd units or termed as logit [23]. It also provides the goodness-of-fit which provides an indication of how well the person, skills and items fit [23] into the readiness of the respondents in becoming a digital society.

4. Findings

The instrument is tested for internal raw score consistency and reliability. The summary statistics gives a Cronbach alpha value at 0.98 which indicates a high internal consistency between the set of items used in this instrument. In confirming further that the high internal consistency value also indicates uni-dimensionality, the data yield Eigenvalue for raw variance explained by measures at 45.6% which is a little less than the modelled value of 46.3%. However the deterrence or the unexplained variance in first contract is still within the range of 5% and lower than 15%. Therefore, the pattern of responses from the instrument showed that there is consistency and all the responses conform to the survey intentions.

Table 1. Person summary statistics

	Logit measure	Model error	Outfit Mean square	Z-Std
Mean	0.21	0.09	1.10	-0.01
S.D.	0.55	0.02	0.59	2.9
Max	2.37	0.25	4.87	7.7
Min	-1.52	0.07	0.28	-6.2

Person reliability	0.97
Person separation	5.33
S.E. of person mean	0.03

The person summary statistics in Table 1, showed a high person reliability at 0.97 which indicate that the person spread is sufficient to show the various levels of person ability. The highest ability person measure is at +2.37 logit and the minimum ability is at -1.52 logit, which gives a spread of 3.89 logit on the measurement ruler with standard error of person mean is 0.03.

Table 1. Item summary statistics

	Logit measure	Model error	Outfit Mean square	Z-Std
Mean	0.00	0.05	1.10	0.05
S.D.	0.46	0.02	0.44	3.8
Max	1.78	0.15	3.02	9.9
Min	-1.37	0.04	0.56	-5.8

Item reliability	0.99
S.E. of item mean	0.05

Item mean is anchored at 0.00 logit served as start point of the measurement ruler [24]. The high item reliability of 0.99 indicates a high sufficiency of item difficulty spread on the measurement ruler. The highest difficulty measures is at 1.78 logit and the minimum difficulty logit is at -1.37 which yield a 3.15 logit spread apart with standard error of 0.05.

The summary statistics provides indication that the instrument is reliable in measuring what is expected, that is able to measure user readiness towards a digital society. The response pattern in the uni-dimensionality check proves the consistency of the response pattern towards what is intended to measure.

5. Discussions

The questionnaire is divided into ten (10) sections in which all will provide measurement on how ready the respondents are towards being a digital society. The ten sections are on Internet usage, perceived ease of use, perceived usefulness relevance, interpersonal and social network, public sector policy, personal factors, communication channel, behavioral intentions and actual use.

Rasch analysis provides person-item distribution map which is known as the Wright map [24, 25]. The Wright map provides picture of respondent readiness by placing the difficulty of the tasks on the same measurement scale as the ability of the respondents. This will enable a comparison of the respondents and items, to better understand how prepared the respondents are.

Refer to Fig. 1 for the Wright map on the readiness of the respondents. The left side of the two vertical histograms are the candidates and the right side shows the items. On the left side of the map shows distribution of measured respondents' ability from most ready on the top to the least ready at the bottom. The items on the right side of the map are distributed from the most difficult at the top to the least difficult at the bottom.

In Fig. 1, the person characteristics or the demography is replaced by "#' since the display is limited and this paper is to explain the readiness of respondents in relation to the ten sections prescribed in the study. Starting at the point where mean item is 0.00logit, where it is marked by the horizontal line, the person distributed fairly between "ready", those located on the top of the horizontal line, and " not ready" towards becoming a digital society.

In general, the respondents perceived that the Internet is easy to learn and the applications make their day-to-day tasks convenient. All the items in the "Perceived ease of use" that is in section C, are located below the mean item 0.00logit indicating that all these items are easy or agreed by the respondents. It is similar for "Perceived usefulness", "Relevance". It is also supported by the "Personal factor" and "Behavioral Intentions".

On the other hand, the respondents observed that "Internet usage", "Public sector policy" and "Communication channel" hinders them from achieving in becoming a successful digital society. All the items in the sections are located above the mean item 0.00logit, indicating that those items are perceived difficult to achieve or satisfied by the respondents.

However it is interesting to note that items in the "Actual usage" sections have almost equal number of items distributed between "less agreeable" and "agreeable".

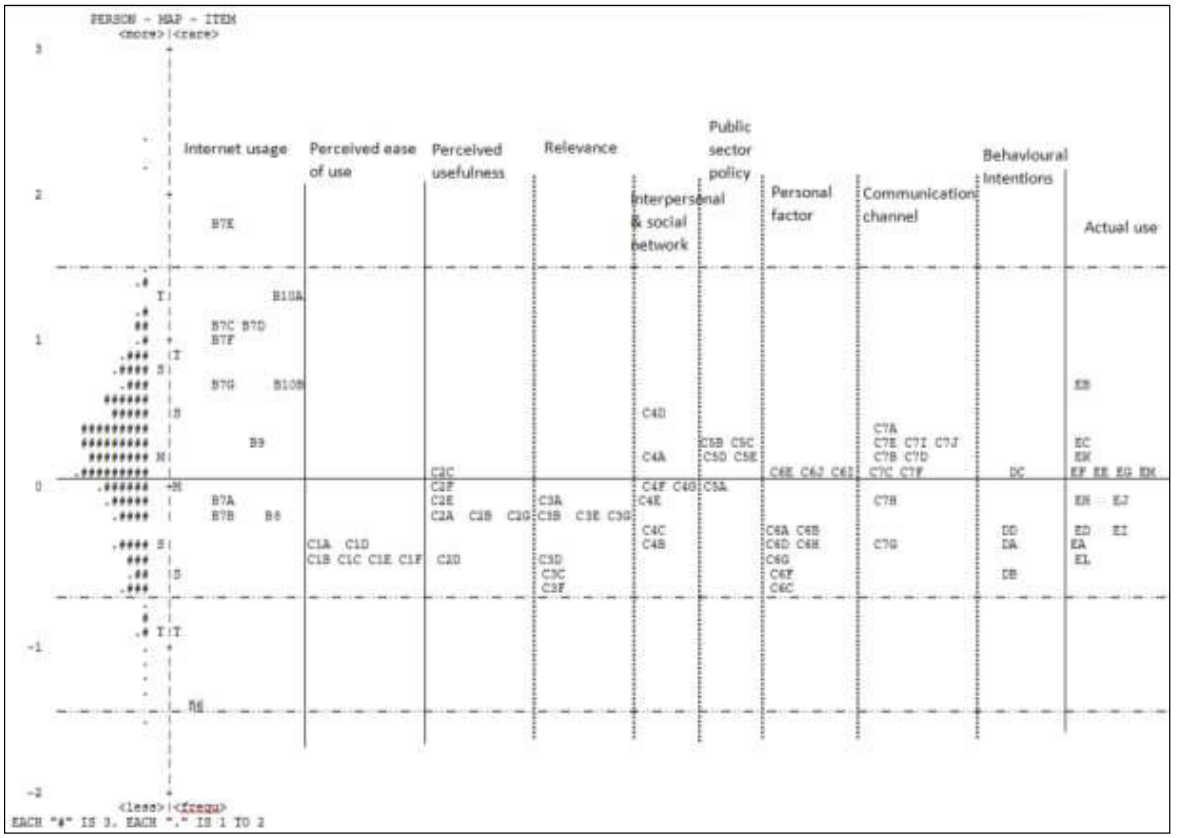

Fig. 1. Wright map: distribution graph of person and items.

6. Conclusions

In general, the society feels that they are ready and have the right skills to use the Internet and its application for their day-to-day activities. They are using the Internet mainly at their offices or schools compared to other places. This might be due to the concern raised that the government should provide more IT facilities and to provide Internet connectivity at public places for them to use it anywhere and anytime. Another issue that need to be considered is the price of subscribing to the Internet services is still high.

Internet connectivity is mainly used for searching and communicating with friends in social media applications. Other than that, Internet connectivity is used for gathering of information, that is to read the news, reading e-books and magazines. It is not common for the respondents to use the Internet for education purposes and gather religious information.

The society still at large is not comfortable to use the Internet for online transactions such as paying the bills, buying goods or even making reservations. This is surely a concern that the government should look into in near future in ensuring that the society is ready and confident in using the Internet services. Security and issue of trustworthy of information surely is a matter in dealing with online transactions and gathering reliable information. Another issue to look into is to encourage the society or academic institutions to use the Internet platform in their education activities.

Rasch measurement model provides a value-added platform in analyzing data that that deals with the behavior of people. The Wright map is a clear summarization of the correlations between the person involved and the tasks

prescribed in the study. This paper only described the generalized findings on the readiness of the society towards being a digital society, and what issues should be look into that hinders them to be a satisfied digital society.

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